

THE ELEMENTARY PRINCIPLES OF
CROP PRODUCTION.

(1) *A Student's Book on Soils and Manures.* By Dr. E. J. Russell. Pp. ix+206. (Cambridge: At the University Press, 1915.) Price 3s. 6d. net.

(2) *Soils and Plant Life as Related to Agriculture.* By Prof. J. C. Cunningham and W. H. Lancelot. Pp. xx+348. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1915.) Price 5s. net.

(1) **I**N the past the "Farm Institute" has been very inadequately represented in our system of agricultural education, but of late much has been done to remedy this defect, and, but for the outbreak of war, more would by now have been accomplished. This type of institution is designed to serve primarily the needs of the country youth whose general education is inadequate for the more advanced courses of the universities and agricultural colleges. The common type of "farm institute" student will thus be the youth whose previous education has been restricted to the curriculum of the rural elementary school with, in most cases, an intervening period of practical work on the farm.

It is for such students that the series of textbooks, of which Dr. Russell's volume is the latest issue, is primarily intended, and by the standard of their capabilities it must be judged. It is not clear just in what way Dr. Russell intends his book to be used. In scope and general mode of presentation it may well serve as a pattern for the teacher, but in the hands of the average "farm institute" student we fear that, without considerable assistance from the teacher, much of it will be rather difficult reading. The fault lies probably not so much with Dr. Russell, who has sacrificed nothing in clearness and attractiveness of presentation, as with the limitations of space imposed upon him, which have necessitated a measure of condensation which is undesirable in all elementary textbooks, and in none more so than in those provided for the agricultural student.

For its refreshingly unorthodox and suggestive treatment of a well-worn subject, the book is highly to be commended. An excellent feature is the freedom with which the results of experiments made in this country have been drawn upon for the purposes of exposition. The Rothamsted experiments naturally have been chiefly drawn upon, but the useful work done elsewhere is more adequately represented than in any other textbook. The book is printed in attractive type, is freely illustrated with photographs and diagrams,

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and, apart from one or two obvious slips, leaves nothing to be desired in precision.

(2) In so far as they cover the same ground, the treatment of the subject by Messrs. Cunningham and Lancelot differs widely from that of Dr. Russell. In their "first study in agriculture for rural, grade, and high schools, based upon sound educational principles," they adopt throughout the didactic method which postulates at each stage the approach to knowledge through individual experimental inquiry. The student is led by easy and connected stages through the study of the origin, nature, and functions of the soil, to the study of the outstanding phenomena of plant life, and the application of the knowledge thus gained to the practical problems of crop production.

The numerous exercises in the first half of the book are well designed and practical in their bearing, and are described with a care which must ensure success in the hands of the most inexperienced student. It is left to the student to draw his own conclusions, although by leading questions his attention is directed to the essential information which it is desired that he shall acquire.

The method of treatment is quite conventional, but is so well and carefully worked out that the intelligent student cannot fail to acquire a very useful knowledge of the subject. A word of commendation must be given to the photographic illustrations, which are numerous and uniformly good.

The work is intended for the American student, and the exercises and illustrations are largely such as appeal most directly to him, but students and teachers in this country will find much that is useful and suggestive in it.

OUR BOOKSHELF.

Third Appendix to the Sixth Edition of Dana's System of Mineralogy. By Prof. W. E. Ford. Completing the work to 1915. Pp. xiii+87. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1915.) Price 6s. 6d. net.

THE study of mineralogy has received a new stimulus in recent years from discoveries in radioactivity and in the use of X-rays for the exploration of crystal-structure. Just as the determination of optical principles from large and specially selected specimens laid the foundations of microscopic petrography, so these later physical experiments are bound to provide new methods of mineral analysis. While enlarging in the widest sense the bounds of human knowledge, they will reveal the alliances and differences among minerals that bring a philosophic touch into the dry matter of classification. The third appendix to Dana's "System of Mineralogy," drawn up by

Prof. Ford, shows the fresh material available for research, and the progress that has been made through new observations on established species in the last six years. A special list is given of literature on X-rays and crystal structure.

Numerous studies on the thermal behaviour of quartz and on its relations to cristobalite and tridymite come within the period covered by this appendix, and the attention of geologists may well be directed to the references given on p. 66. A cross-reference to these would have been useful under the heads of the other forms of crystalline silica. Among the new species we may note barbierite, which indicates that a monoclinic structure may be formed under certain conditions by the well known feldspathic molecule, $\text{NaAlSi}_3\text{O}_8$. Bazzite, a blue scandium silicate from Baveno, and several vanadium minerals seem attractive novelties. Sefstromite, among the latter, passes away as a mixture. Metallic tantalum, first described in 1909, forms an important record, and specimens have already found their way from the Urals into most collections. It is late to quarrel with the makers of new names, but didymolite, with no didymium, platynolite, suggesting platinum when pronounced, and Prof. Ford's own pyroxmangite for "manganopyroxene," strike us as unfortunate. The author of this appendix, however, will at once be gratefully absolved.

G. A. J. C.

The Structure of the Fowl. By Dr. O. C. Bradley. Pp. xi+153. (London: A. and C. Black, Ltd., 1915.) Price 3s. 6d. net.

THE author of this little volume has successfully accomplished a somewhat difficult task in his effort to produce a concise and not too elaborate account of the structure of the fowl. The first chapter deals with the zoological position of birds, and includes a very interesting account of the probable ancestry of the domestic fowl. This is followed by chapters on the skeleton and muscular system, both of which are of necessity dealt with in a very elementary fashion. More detail is entered into when the author deals in successive chapters with the digestive system, the respiratory organs, the urinary organs, the reproductive organs, and the circulatory system. The descriptions of the macroscopic characters of these apparatuses are so clear and lucid that they can be well and easily followed by readers who have received little or no previous anatomical training, while the microscopic structure is dealt with in such a masterly way as to render the book of the greatest assistance to the student of comparative histology and pathology. The illustrations in these sections are excellent, and have very considerably simplified the author's task. The nervous system, the eye and its appendages, and the ear are briefly considered, and a chapter is also devoted to the skin and its appendages.

Probably the best chapter is that on the development of the chick, which is dealt with in rather more detail, the various stages being well illustrated.

While this little book would appear to contain

little or nothing that is new, it is the only work with which we are acquainted that contains such an excellent general description of the structure of the fowl. The illustrations must be regarded as a special feature. There are seventy-three of them, and many are full-page plates.

There is a very complete index. G. H. W.

LETTERS TO THE EDITOR.

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The Structure of the Line of Wave-Length 4686 A.U.

PREVIOUS experiments by one of us (NATURE, vol. xcii., p. 5; *Phil. Mag.*, vol. xxix., pp. 284-297, 1915) have shown that the 4686 line could be obtained by passing a condenser discharge through pure helium, and it was concluded that the results supported a theory put forward by Dr. Bohr (*Phil. Mag.*, vol. xxvi., p. 1, 1913). This theory, which was deduced by applying the quantum hypothesis to Sir Ernest Rutherford's atom-model, ascribed the line to helium. On the other hand, Rydberg, assuming the Pickering lines to constitute the sharp series of hydrogen from analogy with the spectra of the alkali metals, obtained by calculation the value 4687.88 for the wave-length of the first line of the principal series of hydrogen.

The present experiments on the structure of the line were commenced with the purpose of testing still further its chemical origin, and of obtaining results which would throw further light on the mechanism of emission of spectrum lines. The importance of accurate knowledge of the structure of hydrogen and helium lines from the latter point of view has already been shown by Bohr (*Phil. Mag.*, vol. xxix., p. 332, 1915). It is well known that the hydrogen lines of the Balmer series are not single lines, but close doublets, and it is therefore to be expected from both Rydberg's and Bohr's theories, that the 4686 line should also have a complex structure. According to Rydberg's theory, the line should be a doublet having the same frequency difference as the members of the Balmer series. The recent measurements of Buisson and Fabry gave 0.132 A.U. as the separation of the two components of $\text{H}\alpha$, and it follows by calculation that the two components of the 4686 line should be separated by 0.0674 A.U. From Bohr's theory, the details of the structure of the line could not be anticipated, but from the supposed analogy between the mechanism of emission of the 4686 line and the lines of the Balmer series, it was hoped that a knowledge of the structure of the line would serve as a guide in testing different hypotheses for explaining the doubling of the hydrogen lines.

The origin of the "4686" line has recently been studied by Merton (NATURE, vol. xcv., p. 64; *Proc. Roy. Soc.*, vol. xci., p. 382, 1915), who used a method based on Lord Rayleigh's theory of the width of spectrum lines. He concluded that either the breadth of the line is controlled by circumstances at present unknown, or that the line originates from systems of sub-atomic mass. Later experiments by the same author (*Proc. Roy. Soc.*, vol. xci., p. 421, 1915, February, 1916) show that the widths of some spectrum lines are not wholly due to the motion of the molecules.

In our first set of experiments the line was excited by passing a condenser discharge through a helium